

NOAA DATA REPORT ERL PMEL-60

**CTD MEASUREMENTS DURING 1993 AND 1994 AS PART OF THE
EQUATORIAL PACIFIC OCEAN CLIMATE STUDIES (EPOCS)**

VOLUME 1

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CTD Measurements During 1993 and 1994 as Part of the Equatorial Pacific Ocean Climate Studies (EPOCS)

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ABSTRACT. During 1993 and 1994, CTD data were collected in the equatorial Pacific Ocean as part of the Equatorial Pacific Ocean Climate Studies (EPOCS) program. Summaries of Neil Brown Instrument Systems CTD measurements and hydrographic data acquired on twelve cruises and Sea-Bird Electronics CTD measurements and hydrographic data acquired on four cruises during 1993 and 1994 are presented. Section plots of oceanographic variables along 95°, 110°, 125°, 140°, 155°, 170°, and 180°W meridians are given. Station location, meteorological conditions, abbreviated CTD data listings, profiles, and a potential temperature-salinity diagram are shown for each cast. Hydrographic data are listed for each cruise.

1. INTRODUCTION

Oceanographic observations in the eastern equatorial Pacific have been collected since 1979 as part of NOAA's Equatorial Pacific Ocean Climate Studies (EPOCS) program. An objective of the EPOCS program is to investigate the processes that cause sea surface temperature fluctuations on annual and interannual time scales in this area. The Tropical Ocean Global Atmosphere (TOGA) research program investigates the dominant mechanisms that produce large scale, interannual variations of sea surface temperature in vast regions of the tropical Pacific Ocean. Both programs are designed to further understand the role of the tropical ocean in modifying the world's climate. Fall 1993 EPOCS cruises were combined with the Ocean-Atmosphere Carbon Dioxide Exchange (CO₂) program and the U.S. Joint Global Ocean Flux Study (JGOFS). The EPOCS/CO₂/JGOFS effort focused on determining the concentrations of carbon species and describing ocean circulation in the upper ocean over the equatorial Pacific from 140°W to the coast of South America and then modeling the flux of carbon through that system. Summaries of Neil Brown Instrument Systems (NBIS) CTD measurements and hydrographic data collected on twelve cruises and Sea-Bird Electronics (SBE) CTD measurements and hydrographic data collected on four cruises during 1993 and 1994 as part of PMEL's EPOCS/TOGA/CO₂/JGOFS contributions are presented here. CTD data from 1979 through 1992 can be found in previous data reports (Mangum *et al.*, 1980; Mangum and Hayes, 1983, 1985; Mangum *et al.*, 1987, 1993; Lynch *et al.*, 1988; McTaggart *et al.*, 1993; McTaggart and Mangum, 1994).

Data collected in 1993 and 1994 included meridional sections across the equator along 95°, 110°, 125°, 140°, 155°, 170°, and 180°W. Figures 1a–o show the cruise track and CTD station locations for each cruise. Cruise name notation is either EPx-yy-zz or TGx-yy-zz, where x is the sequential EPOCS or TOGA cruise number during each year, yy is the year (93 or 94), and zz is the

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ship code (either MB for the NOAA ship *Malcolm Baldrige* or DI for the NOAA ship *Discoverer*). NBIS Mark IIIb CTDs were used to acquire data on all cruises except for TG1-94-DI, TG2-94-DI, and TG3-94-DI, which used an SBE 911plus CTD system. Pressure, temperature, and conductivity were sampled at a rate of 25–31 Hz (depending on the NBIS CTD), as described by Brown (1974), or 24 Hz, for the SBE 9plus CTD. During EP4-93-DI an SBE SEACAT CTD was used to acquire 2-Hz data (stations 10–28) when the Neil Brown conductivity sensor failed. Typical lowering rates were 30 m/min to 50 m, 45 m/min from 50 m to 200 m, and 60 m/min from 200 m to depth. Water samples were collected on the upcast for calibration purposes using an electronically fired rosette sampler.

2. CTD DATA PROCESSING

Aboard the NOAA ship *Malcolm Baldrige*, CTD data were collected using the shipboard Scientific Computer System (SCS) and AOML Logger software. Preliminary calibration and processing of the CTD data were accomplished at sea using the shipboard microVAX system and PMEL programs. For those cruises aboard the NOAA ship *Discoverer*, NBIS CTD data were collected using a 286-AT personal computer equipped with EG&G Oceansoft acquisition software. SBE CTD data were collected on the *Discoverer* using a 286-AT personal computer equipped with SBE Seasoft acquisition software version 4.201. Under the supervision of the Chief Scientist, survey department personnel were responsible for preparing the CTD, data acquisition, collection of water samples, and analyzing salinity samples using the ship's autosalinometers.

Final calibrations for the conductivity sensors were determined post-cruise by comparison with bottle data and applied to 1-dbar averaged data. EP4-93-DI SEACAT data were calibrated and averaged into 10-dbar bins. An AKIMA spline was used to fill the data such that a record exists for every whole decibar. Salinities for the first three of 19 stations using the SEACAT CTD are 0.2–0.3 pss high in the thermocline region above 15°C when compared to historical data at the same locations. The rest of the SEACAT profiles are within the historical envelope. Final processing of all CTD data were completed at PMEL on a VAX computer system. Detailed information on the calibration and processing routines used are described in Mangum *et al.* (1991) and McTaggart *et al.* (1993).

3. DATA PRESENTATION

Potential temperature, sigma-t, and sigma-theta were calculated using the 1980 equation of state algorithms described by Fofonoff and Millard (1983). Dynamic height in dynamic meters was calculated by integrating from the sea surface. When the uppermost pressure was not equal to 0 db, surface values of temperature and salinity were filled with the values associated with the shallowest pressure for which values did exist (provided this pressure was less than 10 db).

Final data are in PMEL's Equatorial Pacific Information Collection (EPIC) format (Soreide *et al.*, 1995). The majority of the plots that follow were produced using Plot Plus Scientific Graphics

System (Denbo, 1992). Tables 2–6 define the abbreviations and units used in the CTD data summary listings. Hydrographic bottle data at discrete depths are listed for each cruise.

4. ACKNOWLEDGMENTS

The assistance of the officers and crew of the NOAA ships *Malcolm Baldrige* and *Discoverer* is gratefully acknowledged. Salinity analyses were successfully completed by each ship's survey department personnel. Margie McCarty, Linda Stratton, and LTJG Julia Neander supervised CTD operations and completed preliminary calibrations and processing at sea. This research was supported in part by NOAA's EPOCS program, the U.S. TOGA program, the NOAA Office of Global Programs sponsored Ocean–Atmosphere Carbon Dioxide Exchange program, and the U.S. Joint Global Ocean Flux Study.

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FIGURES AND TABLES

EP1-93-MB CRUISE TRACK
February 24 – March 18, 1993
San Diego, CA – San Diego, CA

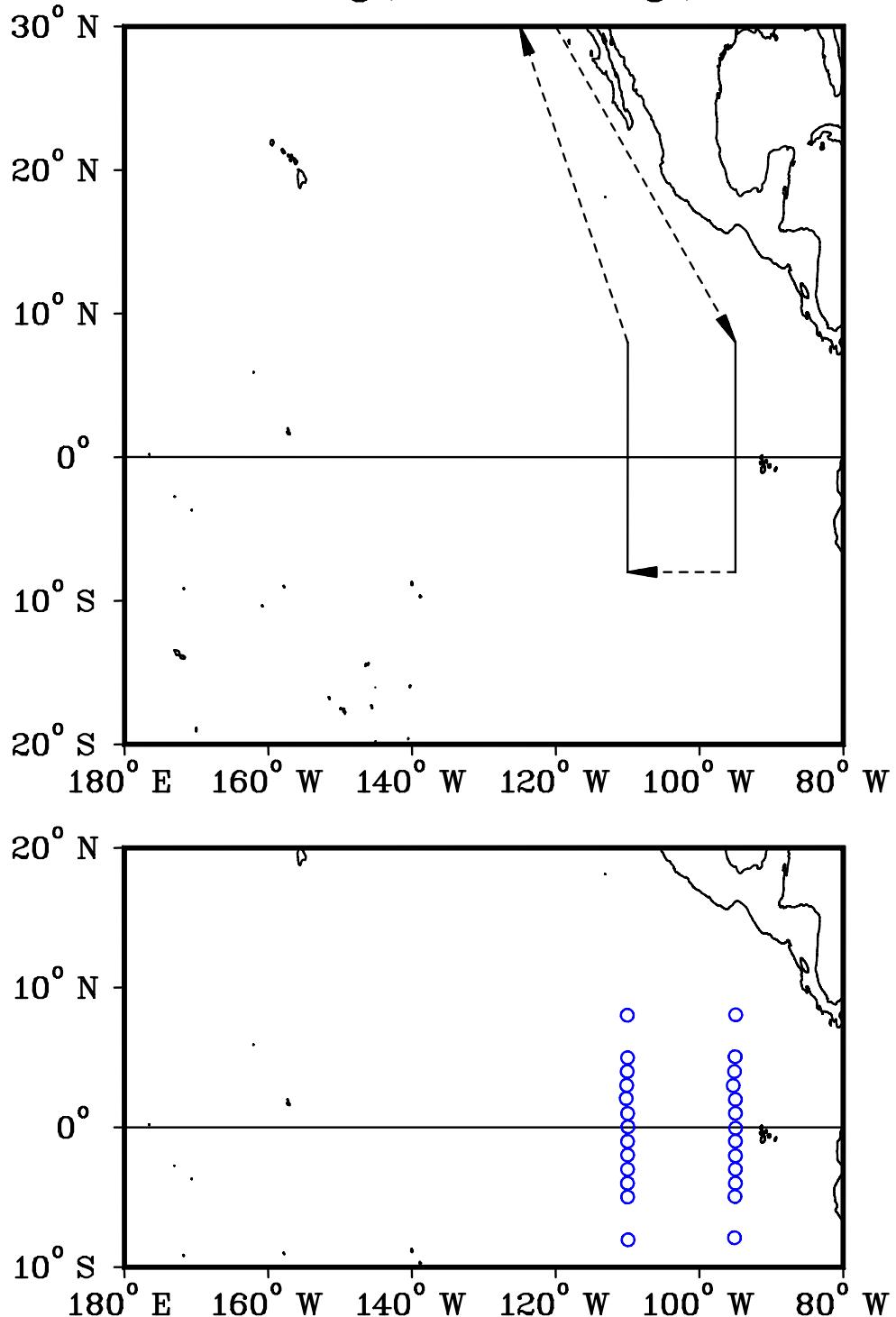


Fig. 1a. EP1-93-MB cruise track and station locations.

Table 1a. EP1-93-MB CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	8 3.2N	94 57.5W	28 FEB 93	504	61	12	1929	1001
2	5 3.4N	95 2.5W	28 FEB 93	1758	105	6	3800	997
3	3 59.8N	95 7.2W	1 MAR 93	929	338	10	3404	1014
4	2 59.5N	95 18.5W	1 MAR 93	1651	256	10	2831	998
5	1 59.9N	95 0.1W	2 MAR 93	525	231	40	6750	995
6	1 0.6N	94 59.9W	3 MAR 93	153	204	4	3438	998
7	0 3.5S	94 58.2W	3 MAR 93	758	290	2	3265	1014
8	0 59.2S	94 59.7W	3 MAR 93	1259	289	8	4762	1019
9	2 2.0S	94 59.5W	3 MAR 93	1941	165	6	3300	997
10	2 59.6S	95 0.1W	4 MAR 93	100	323	6	3490	997
11	3 59.4S	94 59.9W	4 MAR 93	619	47	9	3623	1004
12	4 56.7S	95 3.6W	4 MAR 93	1141	75	16	3673	1017
13	7 53.6S	95 7.8W	5 MAR 93	852	110	20	3823	1016
14	8 2.5S	109 55.6W	8 MAR 93	558	120	19	3364	998
15	4 58.6S	109 59.3W	9 MAR 93	2128	119	20	1948	998
16	4 0.0S	110 0.7W	10 MAR 93	1115	130	16	3641	1018
17	2 59.8S	110 0.1W	10 MAR 93	1639	70	10	2048	999
18	1 58.5S	109 59.6W	10 MAR 93	2222	93	10	5319	998
19	1 0.1S	110 0.5W	11 MAR 93	324	92	14	3780	1012
20	0 2.5N	109 57.1W	11 MAR 93	941	58	12	3733	1016
21	0 59.9N	109 59.4W	11 MAR 93	1518	112	15	2035	1001
22	2 4.0N	110 11.7W	11 MAR 93	2156	90	10	3647	1000
23	3 0.5N	110 7.8W	12 MAR 93	301	90	14	3728	997
24	3 59.9N	110 2.7W	12 MAR 93	818	62	16	3823	1008
25	4 58.9N	110 0.1W	12 MAR 93	2003	60	18	2075	998
26	8 1.4N	110 2.3W	13 MAR 93	1909	60	20	2175	998

EP2-93-MB CRUISE TRACK
April 1 – May 14, 1993
San Diego, CA – Honolulu, HI

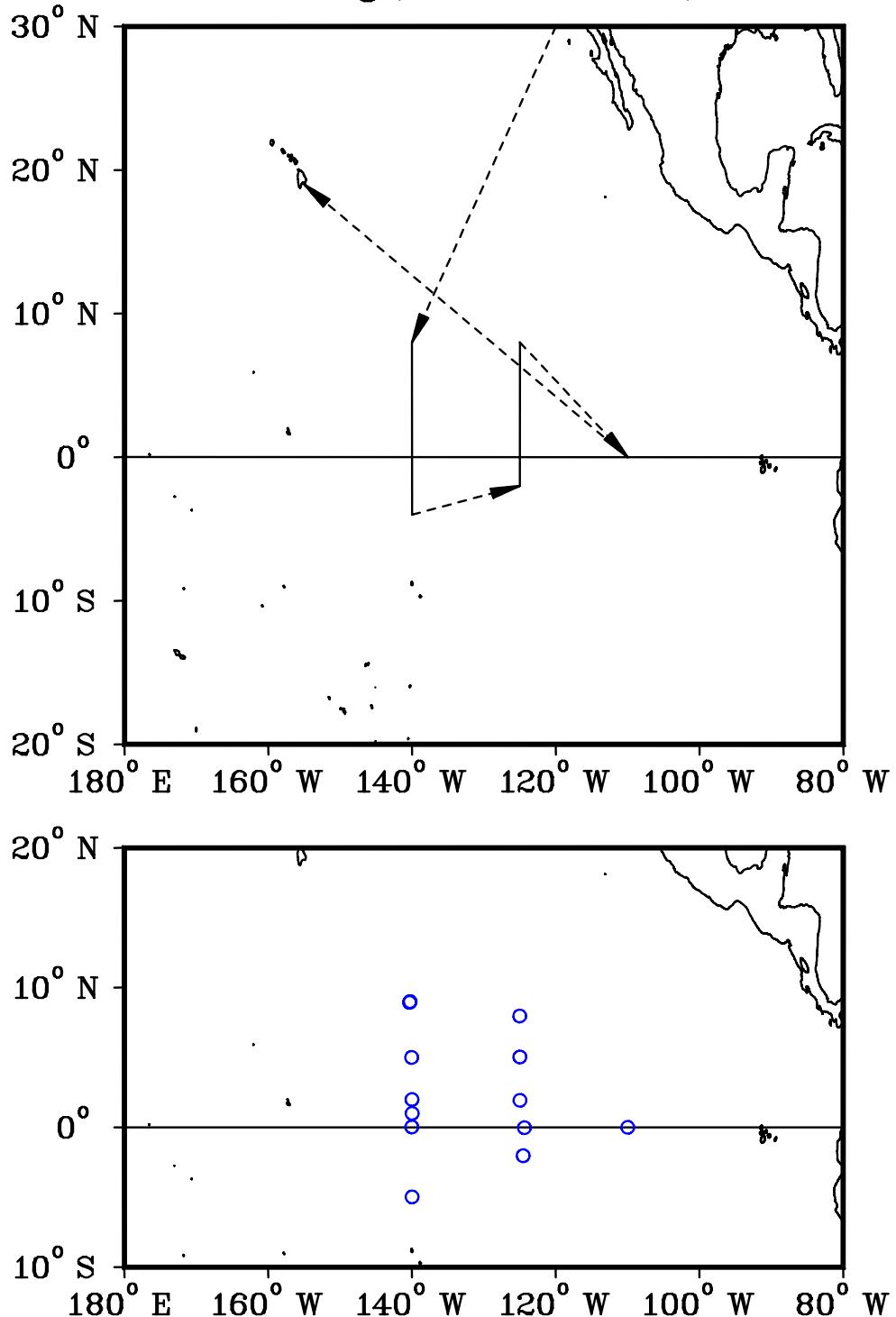


Fig. 1b. EP2-93-MB cruise track and station locations.

Table 1b. EP2-93-MB CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	8 56.6N	140 20.0W	23 APR 93	1026	0	0	5103	1019
2	9 0.0N	140 15.0W	24 APR 93	700	60	18	5020	500
3	5 0.3N	140 2.6W	25 APR 93	308	50	12	4234	1000
4	1 59.5N	139 59.7W	26 APR 93	548	115	12	4258	999
5	1 0.3N	139 58.0W	26 APR 93	1128	108	12	4449	1019
6	0 1.8N	140 0.8W	27 APR 93	619	105	9	4209	1000
7	4 58.3S	139 58.7W	28 APR 93	2203	119	4	4302	998
8	2 1.5S	124 31.8W	1 MAY 93	2136	165	12	0	501
9	0 1.3S	124 21.4W	2 MAY 93	1003	104	4	3976	1016
10	1 56.2N	124 58.1W	3 MAY 93	334	60	2	4545	998
11	5 2.3N	124 59.4W	3 MAY 93	2308	103	8	0	1000
12	7 58.3N	125 0.3W	4 MAY 93	1923	5	17	4654	1000
13	0 0.3N	109 58.2W	8 MAY 93	1115	0	0	3768	1182

TG1-93-DI CRUISE TRACK
February 25 – March 15, 1993
Hilo, HI – Pago Pago, Samoa

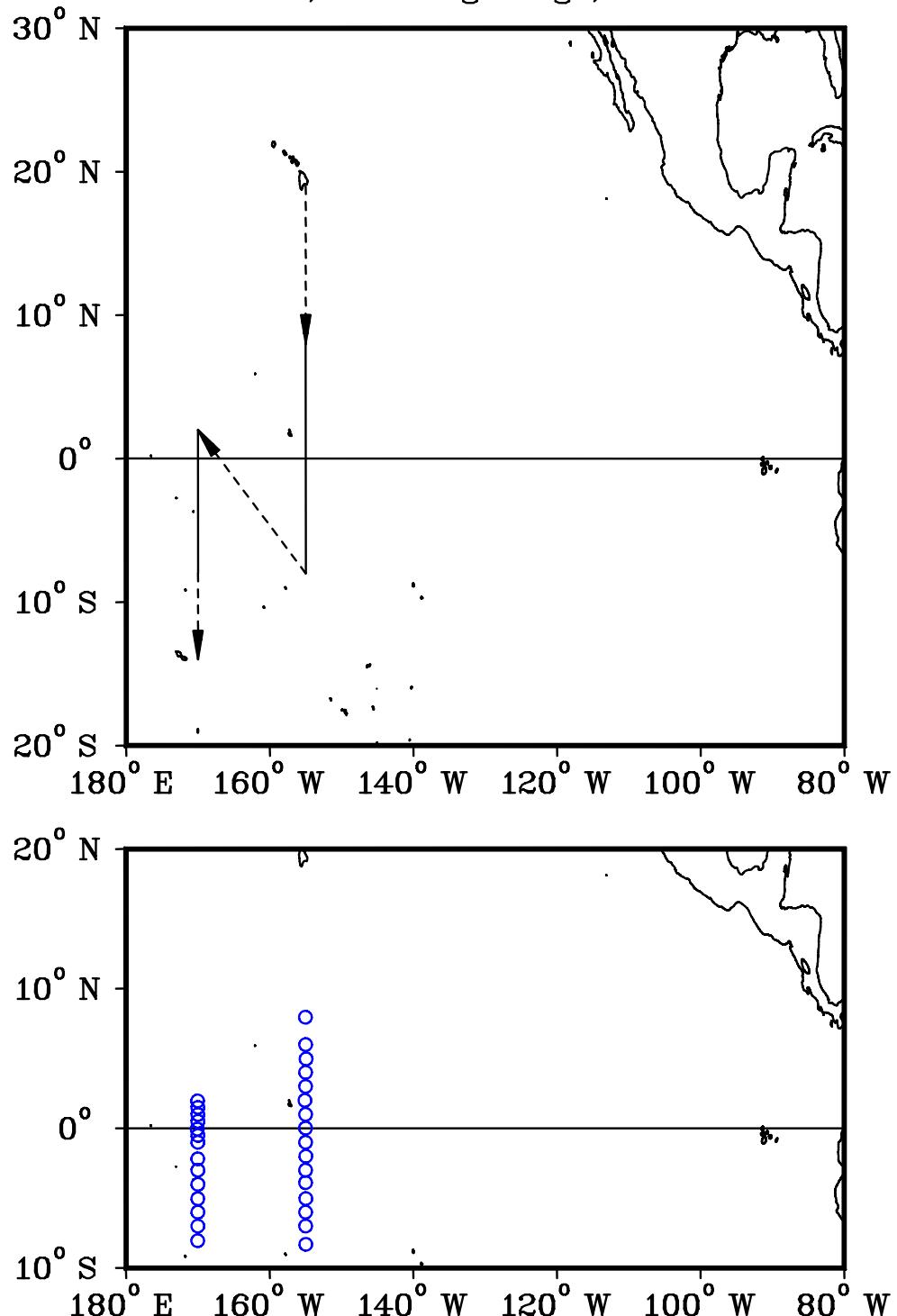


Fig. 1c. TG1-93-DI cruise track and station locations.

Table 1c. TG1-93-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D	W/S	DEPTH	CAST
					T	(kts)	(m)	(db)
1	15 4.4N	154 48.1W	27 FEB 93	0220	66	29	5531	4437
2	7 57.5N	155 1.5W	28 FEB 93	1014	60	16	5209	992
3	5 59.8N	154 59.8W	18 FEB 93	1951	70	20	4872	1006
4	4 58.4N	154 55.7W	1 MAR 93	142	77	16	4598	994
5	4 0.4N	155 0.2W	1 MAR 93	720	80	16	4681	991
6	3 0.1N	155 0.1W	1 MAR 93	1250	100	12	4736	995
7	2 0.1N	155 6.1W	2 MAR 93	814	110	10	4663	994
8	1 0.1N	155 0.0W	2 MAR 93	1407	100	15	4762	993
9	0 1.0N	155 1.0W	2 MAR 93	2108	100	10	4681	993
10	0 59.9S	155 0.2W	3 MAR 93	312	75	12	4746	994
11	1 59.8S	154 58.1W	3 MAR 93	952	55	12	4973	992
12	2 59.5S	155 0.1W	3 MAR 93	1530	25	8	4974	994
13	3 53.2S	155 0.7W	3 MAR 93	2025	5	3	3791	992
14	5 1.8S	154 58.1W	4 MAR 93	235	18	7	5056	992
15	6 0.0S	154 59.9W	4 MAR 93	732	40	4	5214	994
16	6 59.5S	154 59.6W	4 MAR 93	1238	75	4	5102	992
17	8 18.2S	154 58.7W	5 MAR 93	711	350	7	5261	991
18	1 57.8N	170 2.9W	9 MAR 93	849	80	10	5414	2991
19	1 30.0N	170 0.0W	9 MAR 93	1320	70	6	5489	2991
20	0 59.5N	170 0.1W	9 MAR 93	1829	93	10	5453	2117
21	0 30.0N	170 0.0W	9 MAR 93	2220	70	10	5452	994
22	0 3.1S	170 5.3W	10 MAR 93	952	80	9	5576	4989
23	0 30.4S	170 0.0W	10 MAR 93	1503	90	7	5671	2990
24	0 59.8S	170 0.3W	10 MAR 93	2005	80	6	5340	2151
25	2 11.0S	170 1.0W	13 MAR 93	133	60	8	4997	993
26	3 0.0S	170 0.0W	13 MAR 93	629	40	12	5108	993
27	4 0.6S	170 0.0W	13 MAR 93	1203	20	10	5714	993
28	5 2.3S	170 0.9W	13 MAR 93	1839	0	8	5395	991
29	6 0.2S	170 0.0W	13 MAR 93	2359	300	5	4782	991
30	6 59.8S	170 0.4W	14 MAR 93	623	350	2	4744	994
31	8 2.6S	170 1.5W	14 MAR 93	1240	0	0	5346	992

TG2-93-DI CRUISE TRACK
March 19 – April 8, 1993
Pago Pago, Samoa – Kahalui, HI

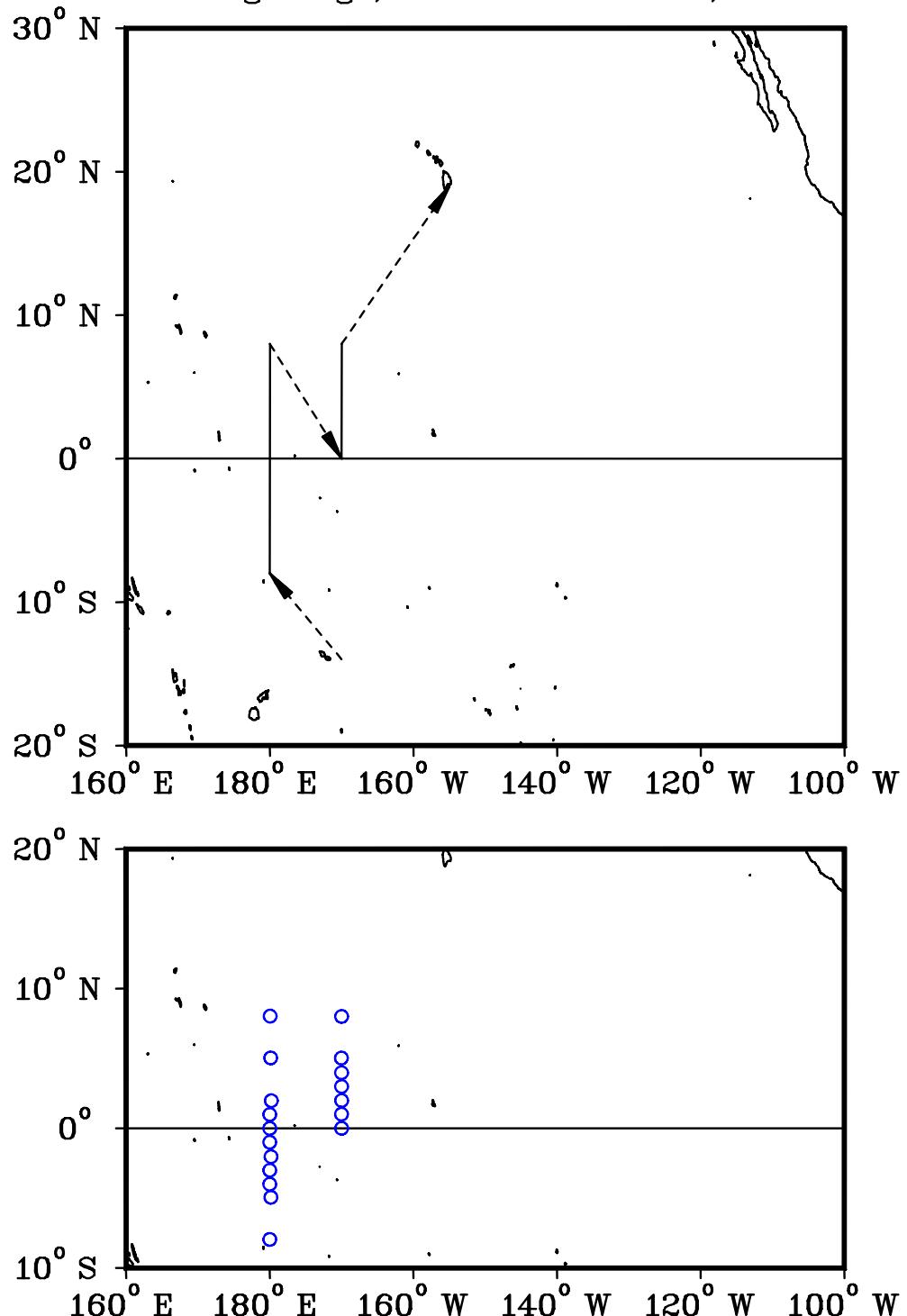


Fig. 1d. TG2-93-DI cruise track and station locations.

Table 1d. TG2-93-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	7 57.2S	179 59.3W	23 MAR 93	1	350	12	5472	991
2	4 56.3S	179 50.1W	23 MAR 93	1812	25	4	5683	992
3	3 59.9S	179 59.9W	24 MAR 93	648	0	0	5783	983
4	3 0.0S	179 59.7W	24 MAR 93	1242	20	5	5056	991
5	2 1.6S	179 49.2W	24 MAR 93	2308	50	10	5326	993
6	0 59.5S	179 59.8W	25 MAR 93	1110	60	6	5303	1012
7	0 0.2S	179 59.9W	25 MAR 93	2135	90	9	5229	993
8	0 59.6N	179 59.7W	26 MAR 93	1108	120	10	5734	965
9	1 58.6N	179 46.3W	26 MAR 93	2200	0	0	5413	992
10	5 2.6N	179 51.9W	28 MAR 93	727	55	13	5507	491
11	8 2.1N	179 56.1W	29 MAR 93	58	70	18	5921	494
12	0 0.1N	169 59.5W	1 APR 93	1714	100	4	5468	990
13	1 0.8N	170 0.2W	2 APR 93	756	130	11	5416	992
14	1 59.5N	169 59.5W	2 APR 93	1337	120	5	5365	993
15	2 59.8N	169 59.9W	2 APR 93	1938	110	15	5430	989
16	3 59.0N	169 59.9W	3 APR 93	132	0	0	5640	990
17	5 1.9N	170 1.4W	3 APR 93	1348	0	10	5663	991
18	8 0.6N	169 59.7W	4 APR 93	2147	50	21	5457	994

EP3-93-DI CRUISE TRACK
August 23 – September 20, 1993
San Diego, CA – San Diego, CA

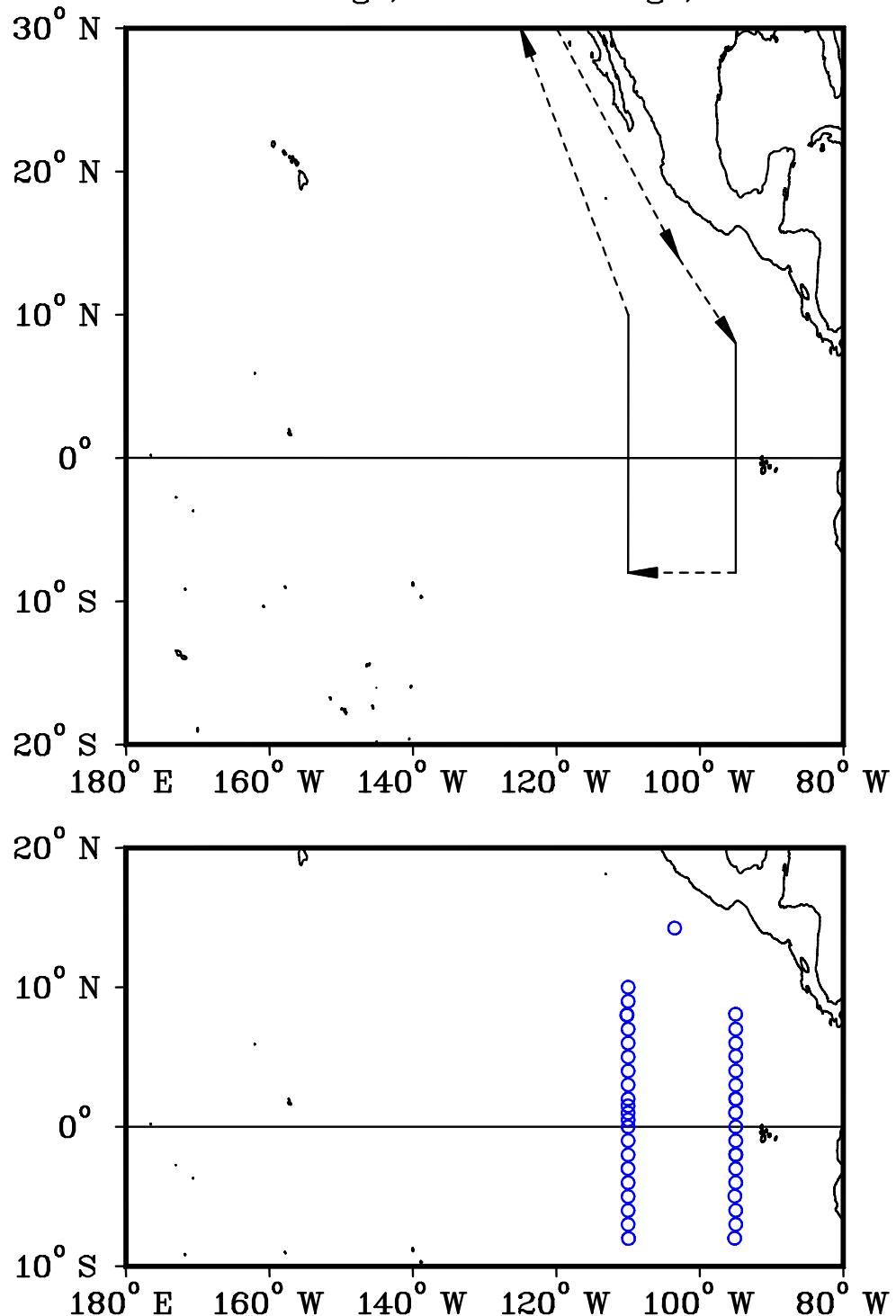


Fig. 1e. EP3-93-DI cruise track and station locations.

Table 1e. EP3-93-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
0	14 14.9N	103 30.5W	27 AUG 93	1911	0	0	3197	999
1	8 4.4N	95 1.1W	29 AUG 93	2044	270	16	3530	1003
2	7 0.2N	94 59.8W	30 AUG 93	519	290	7	3686	998
3	5 59.8N	94 59.6W	30 AUG 93	1039	230	8	3595	998
4	5 4.3N	95 0.3W	30 AUG 93	1540	200	8	3596	1001
5	4 0.3N	94 59.9W	31 AUG 93	26	180	12	3477	1002
6	2 59.9N	95 0.0W	31 AUG 93	600	180	17	2712	1001
7	2 0.1N	95 0.5W	31 AUG 93	1129	170	17	3153	1009
8	1 58.8N	94 58.2W	31 AUG 93	2255	170	15	2974	1002
9	1 0.7N	95 1.3W	1 SEP 93	416	150	11	3504	1010
10	0 0.0N	95 0.1W	1 SEP 93	1023	135	10	3345	1002
11	1 0.1S	94 59.9W	2 SEP 93	601	155	6	3325	1003
12	1 59.3S	95 0.5W	2 SEP 93	1127	155	6	3339	1000
13	2 0.8S	94 58.3W	3 SEP 93	18	150	12	3313	502
14	3 0.4S	94 59.9W	3 SEP 93	531	130	8	3548	1003
15	3 59.8S	95 0.3W	3 SEP 93	1044	120	5	3679	1002
16	4 58.3S	95 7.1W	3 SEP 93	1543	105	13	3782	1002
17	5 59.8S	95 0.1W	4 SEP 93	59	145	11	3856	1000
18	7 0.0S	95 0.0W	4 SEP 93	624	150	10	3970	1002
19	7 59.3S	95 8.9W	4 SEP 93	1207	155	13	3958	1004
20	8 0.4S	109 56.8W	7 SEP 93	231	115	21	3479	1004
21	7 0.0S	110 0.0W	7 SEP 93	818	115	23	3536	1001
22	6 0.0S	110 0.3W	7 SEP 93	1351	90	18	3543	1010
23	5 0.0S	110 0.2W	7 SEP 93	1911	110	16	3603	1000
24	4 0.5S	110 0.4W	8 SEP 93	155	100	13	3618	1001
25	2 59.4S	110 0.9W	8 SEP 93	715	105	17	3787	1011
26	2 0.7S	110 0.2W	9 SEP 93	340	140	14	3903	1002
27	0 59.5S	109 59.9W	9 SEP 93	929	120	12	3978	1002
28	0 0.0S	110 0.5W	10 SEP 93	427	85	7	3802	1003
29	0 29.9N	109 59.9W	10 SEP 93	749	60	11	3803	1002
30	0 59.8N	110 0.2W	10 SEP 93	1106	110	10	3821	1005
31	1 30.2N	110 0.6W	10 SEP 93	1428	120	12	3772	1002
32	1 59.9N	110 0.0W	11 SEP 93	735	120	16	3760	1000
33	3 0.5N	110 0.4W	12 SEP 93	214	130	15	3905	1004
34	4 0.2N	109 59.9W	12 SEP 93	641	110	8	3890	1000
35	5 0.3N	109 59.9W	12 SEP 93	1141	115	4	3899	1002
36	6 0.1N	109 59.9W	12 SEP 93	2158	0	0	3709	1001
37	7 0.2N	109 59.9W	13 SEP 93	255	0	0	3763	928
38	8 0.2N	110 9.9W	13 SEP 93	805	350	4	4129	1002
39	8 1.9N	110 9.4W	14 SEP 93	113	55	11	4205	502
40	8 59.9N	109 59.8W	14 SEP 93	608	20	13	4113	998
41	10 0.3N	109 59.8W	14 SEP 93	1109	90	20	3309	1001

EP4-93-DI CRUISE TRACK
September 25 – October 22, 1993
San Diego, CA – Honolulu, HI

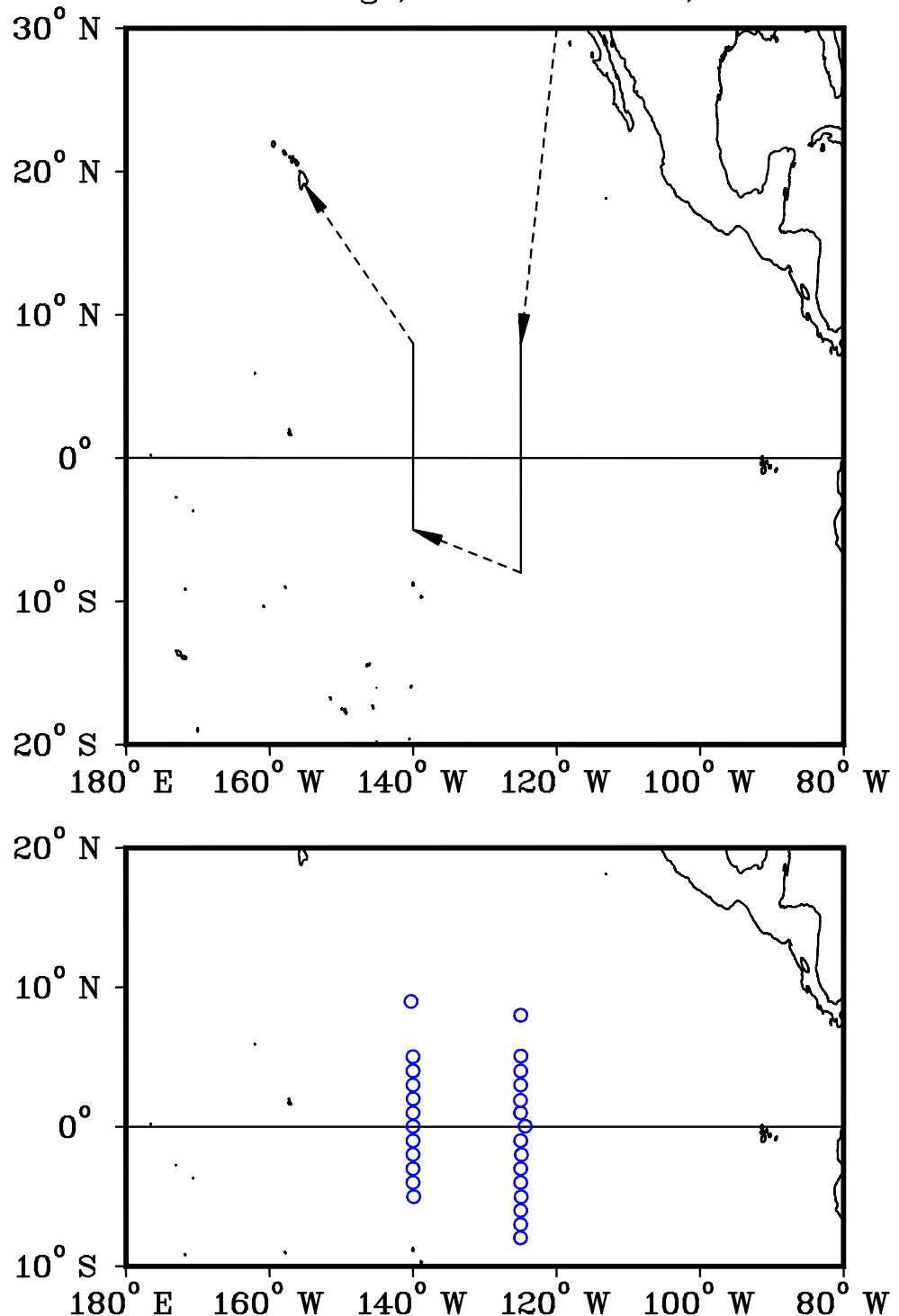


Fig. 1f. EP4-93-DI cruise track and station locations.

Table 1f. EP4-93-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D		W/S (kts)	DEPTH (m)	CAST (db)
					T				
2	8 0.1N	124 59.6W	30 SEP 93	822	190	8	4680	1004	
3	5 4.3N	124 58.7W	1 OCT 93	825	170	7	4367	1004	
4	4 0.0N	125 0.0W	1 OCT 93	1416	140	12	4485	1003	
5	2 59.5N	125 0.1W	1 OCT 93	1958	130	12	4446	1500	
6	1 53.8N	125 1.8W	2 OCT 93	207	135	13	4618	1002	
7	1 0.0N	125 0.8W	2 OCT 93	711	110	8	4574	1000	
8	0 2.5N	124 22.1W	3 OCT 93	643	115	13	4637	1000	
9	0 59.6S	124 59.9W	3 OCT 93	1259	115	10	4674	1000	
10*	2 0.0S	124 53.5W	4 OCT 93	609	105	18	4710	1008	
11*	3 0.0S	125 0.0W	4 OCT 93	1146	110	15	4541	999	
12*	3 59.6S	124 59.9W	4 OCT 93	1717	90	15	4432	1010	
13*	5 1.3S	124 56.0W	5 OCT 93	1950	65	14	4543	996	
14*	6 0.1S	125 0.0W	6 OCT 93	100	90	11	4796	996	
15*	7 0.1S	125 0.0W	6 OCT 93	633	80	13	4740	997	
16*	7 57.6S	125 1.2W	6 OCT 93	1224	80	11	4549	999	
17*	5 0.3S	139 54.3W	10 OCT 93	127	90	13	4358	996	
18*	3 59.8S	140 0.1W	10 OCT 93	1122	95	13	4495	996	
19*	3 0.0S	140 0.2W	10 OCT 93	1639	90	13	4412	997	
20*	1 58.9S	140 0.6W	11 OCT 93	304	65	14	4175	996	
21*	1 0.0S	139 59.8W	12 OCT 93	158	75	12	4273	1000	
22*	0 2.1N	139 59.7W	13 OCT 93	311	95	19	4330	999	
23*	0 59.9N	140 0.1W	13 OCT 93	828	100	20	4305	998	
24*	2 0.4N	139 58.7W	14 OCT 93	847	120	14	4376	998	
25*	2 59.5N	140 0.5W	15 OCT 93	900	130	13	4298	997	
26*	4 0.5N	139 59.9W	15 OCT 93	1407	130	11	4351	997	
27*	5 1.5N	140 0.6W	16 OCT 93	353	130	10	4426	998	
28*	8 59.2N	140 16.8W	17 OCT 93	308	200	5	4836	996	

* SEACAT CTD

EP5-93-DI CRUISE TRACK
October 25 – November 15, 1993
Honolulu, HI – Pago Pago, Samoa

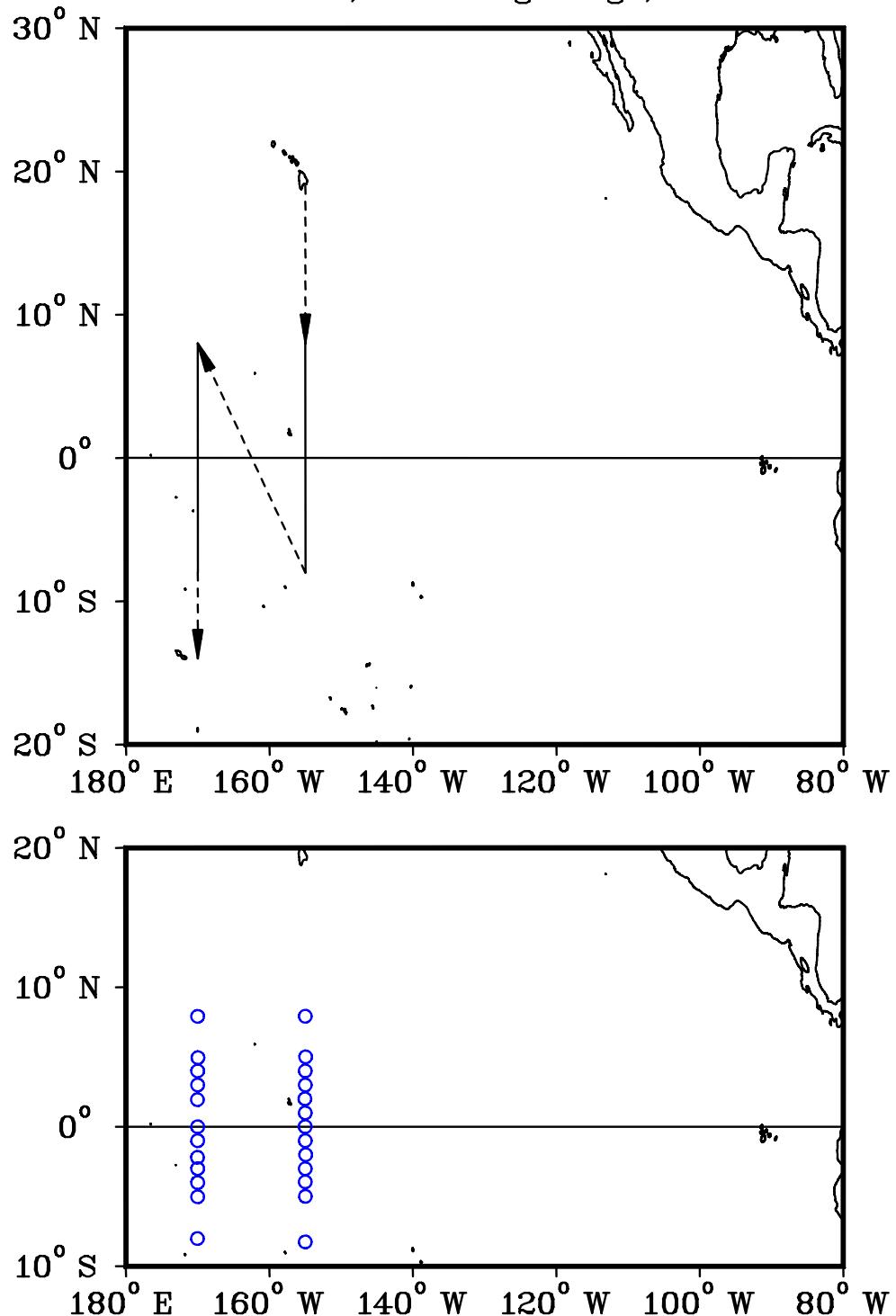


Fig. 1g. EP5-93-DI cruise track and station locations.

Table 1g. EP5-93-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D	W/S	DEPTH	CAST
					T	(kts)	(m)	(db)
1	7 55.6N	154 59.8W	28 OCT 93	1250	60	8	5194	1002
2	5 0.9N	154 56.8W	30 OCT 93	605	0	0	4583	1001
3	4 0.4N	155 0.1W	30 OCT 93	1226	150	12	4668	1008
4	2 59.9N	154 59.8W	30 OCT 93	1741	150	10	4722	1003
5	2 0.3N	155 2.9W	31 OCT 93	55	140	8	4697	1001
6	1 0.0N	155 0.6W	31 OCT 93	639	115	5	4750	999
7	0 0.8N	155 1.1W	31 OCT 93	1618	70	10	4667	1003
8	0 59.7S	154 59.9W	1 NOV 93	1007	80	8	4726	1007
9	2 0.0S	154 56.8W	1 NOV 93	1617	75	18	4969	1001
10	3 0.2S	155 0.2W	2 NOV 93	1058	85	13	4925	1002
11	3 56.9S	155 0.2W	2 NOV 93	1603	60	15	2447	1002
12	4 59.3S	154 58.9W	3 NOV 93	1053	110	6	4889	1001
13	8 15.2S	155 0.2W	4 NOV 93	1935	240	18	5296	1002
14	7 55.2N	170 0.1W	9 NOV 93	1232	100	6	5490	5620
15	4 57.4N	169 57.6W	10 NOV 93	418	65	7	5746	1002
16	4 0.3N	170 0.2W	10 NOV 93	931	126	26	5592	1006
17	2 59.9N	170 0.1W	10 NOV 93	1505	140	20	5445	1001
18	1 56.7N	170 2.2W	10 NOV 93	2140	110	12	5370	1006
19	0 0.2N	170 0.2W	11 NOV 93	654	70	22	5461	1002
20	0 59.7S	170 0.1W	11 NOV 93	1800	40	16	5394	1003
21	2 11.5S	170 1.5W	12 NOV 93	10	50	14	4947	1003
22	3 0.0S	170 0.1W	12 NOV 93	605	60	17	5077	1004
23	4 0.1S	169 59.8W	12 NOV 93	1119	75	17	5634	1004
24	5 1.1S	170 0.1W	13 NOV 93	639	70	15	5374	1004
25	8 0.7S	170 2.2W	14 NOV 93	1059	60	7	5350	1002

EP6-93-DI CRUISE TRACK
November 18 – December 3, 1993
Pago Pago, Samoa – Seattle, WA

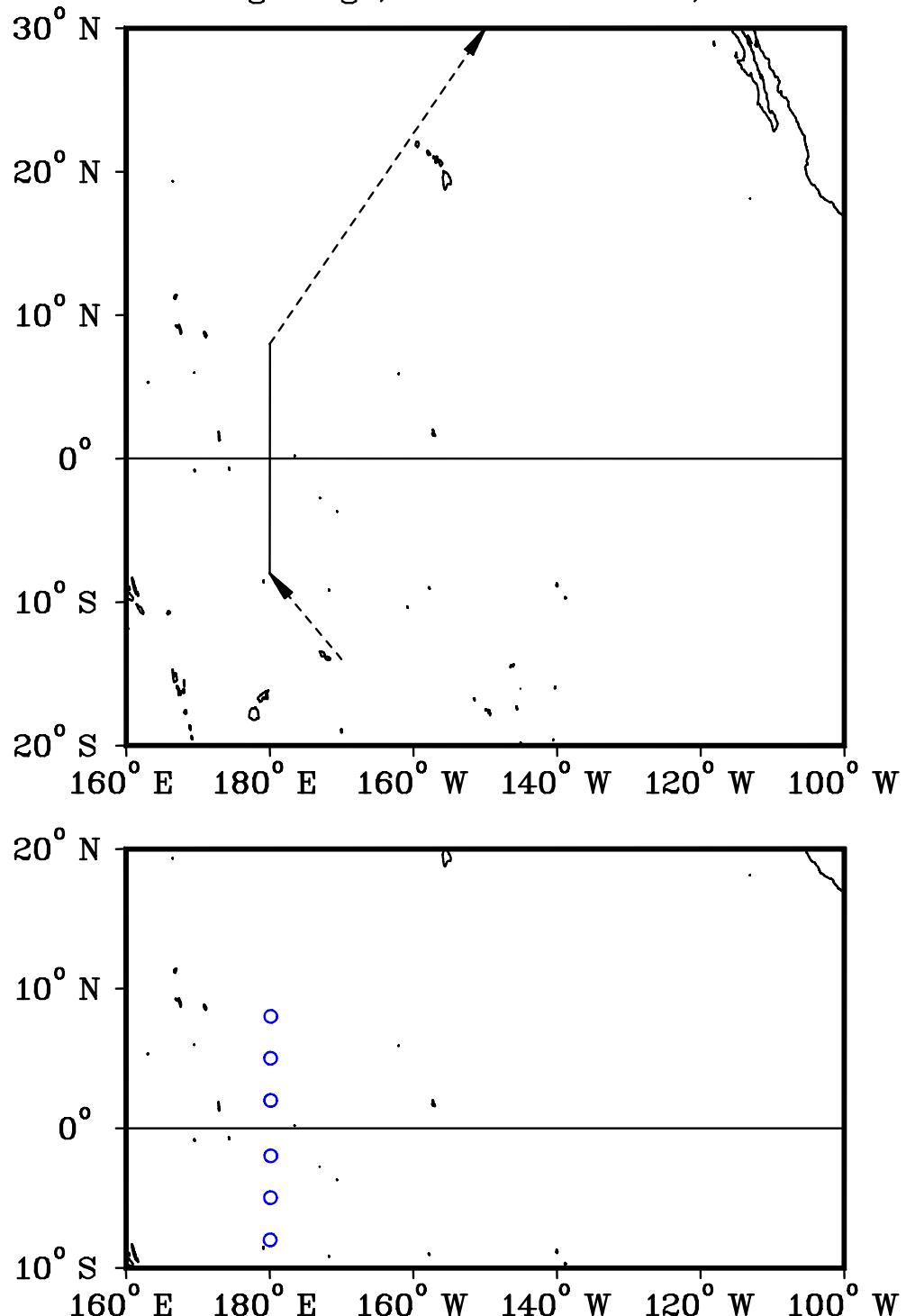


Fig. 1h. EP6-93-DI cruise track and station locations.

Table 1h. EP6-93-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	7 59.0S	179 56.3W	21 NOV 93	1217	330	7	5533	1001
2	4 57.8S	179 53.6W	22 NOV 93	230	35	4	5620	1000
3	1 58.2S	179 51.4W	22 NOV 93	1613	106	3	0	1006
4	1 59.9N	179 52.1W	27 NOV 93	1446	0	0	5420	1007
5	5 1.1N	179 52.7W	28 NOV 93	636	280	6	5592	1003
6	8 0.9N	179 51.3W	29 NOV 93	438	85	17	5879	994

EP1-94-MB CRUISE TRACK
April 15 – May 11, 1994
Rodman, Panama – San Diego, CA

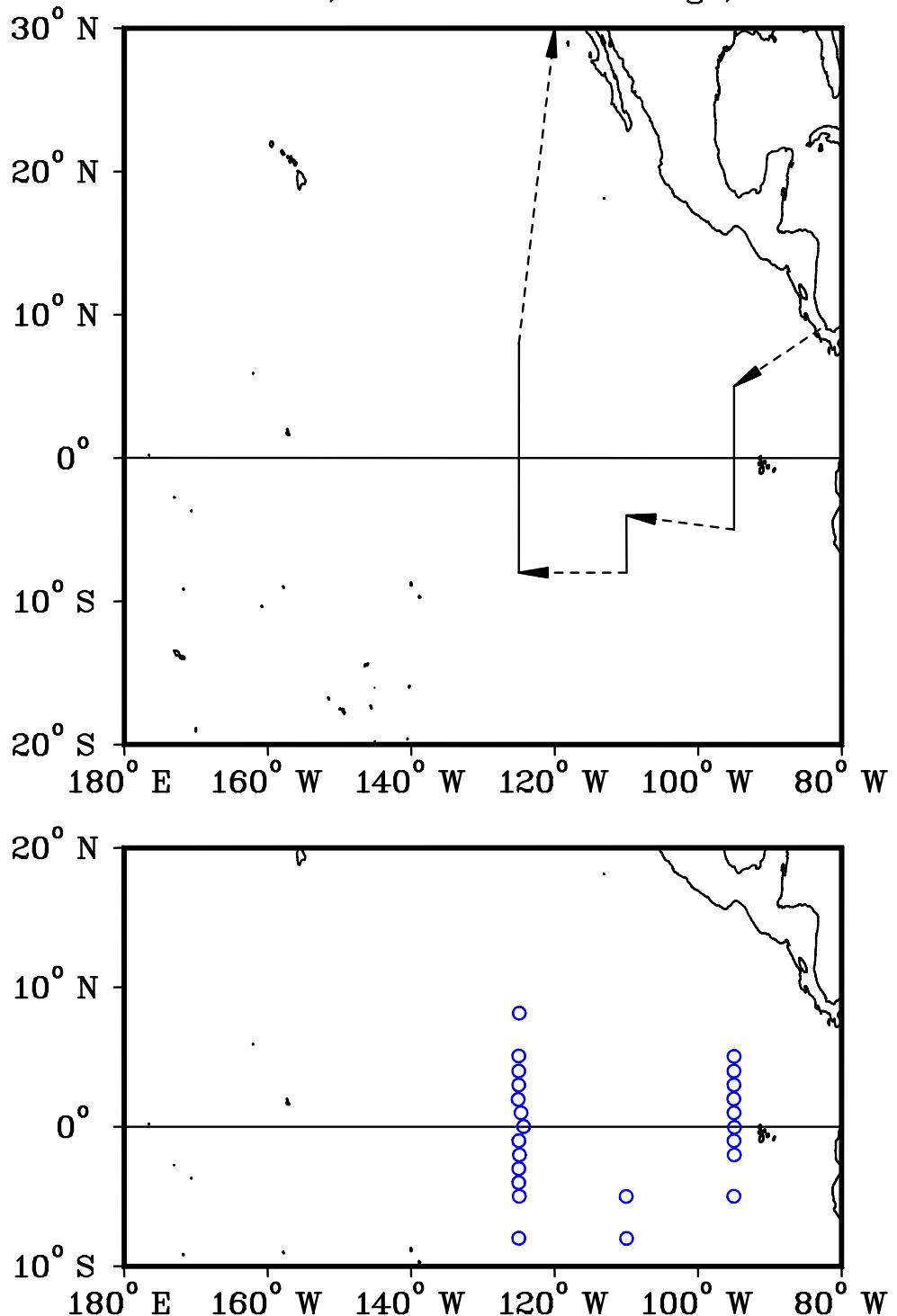


Fig. 1i. EP1-94-MB cruise track and station locations.

Table 1i. EP1-94-MB CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	5 2.8N	94 59.6W	19 APR 94	1936	245	6	3475	940
2	3 59.8N	95 0.5W	20 APR 94	240	190	12	3458	985
3	3 0.3N	95 0.5W	20 APR 94	852	175	10	3032	992
4	2 0.0N	95 1.4W	21 APR 94	444	148	8	3177	978
5	1 0.2N	94 59.9W	21 APR 94	1201	150	4	3243	992
6	0 2.2S	94 56.5W	21 APR 94	1802	123	5	3271	991
7	1 0.0S	94 59.8W	22 APR 94	133	120	17	3319	994
8	2 0.9S	94 57.8W	22 APR 94	734	80	12	3382	988
9	4 58.6S	95 1.4W	23 APR 94	413	135	18	3902	1003
10	4 57.4S	110 03.0W	26 APR 94	327	143	21	1735	502
11	4 59.4S	110 1.7W	26 APR 94	2245	130	20	3557	1002
12	8 0.2S	109 58.5W	28 APR 94	148	128	13	3424	999
13	7 59.4S	124 59.9W	30 APR 94	2104	115	20	4521	989
14	4 58.7S	124 56.0W	1 MAY 94	2103	132	20	4537	990
15	4 0.0S	125 0.4W	2 MAY 94	1321	0	0	0	1000
16	2 59.9S	124 59.8W	2 MAY 94	858	110	20	4548	989
17	2 0.9S	124 54.2W	2 MAY 94	1438	100	18	4670	991
18	1 0.1S	124 59.5W	2 MAY 94	2030	85	20	4597	991
19	0 1.2N	124 19.5W	3 MAY 94	406	93	16	4668	1004
20	1 0.2N	124 41.1W	3 MAY 94	1000	80	16	4649	991
21	1 57.9N	125 4.8W	4 MAY 94	512	110	14	4690	1002
22	2 59.9N	125 0.4W	4 MAY 94	1149	110	13	4520	992
23	3 59.9N	125 0.3W	4 MAY 94	1732	120	15	4550	994
24	5 4.9N	125 0.0W	5 MAY 94	23	142	16	4369	1003
25	8 9.0N	124 55.7W	6 MAY 94	335	201	12	4404	1003

EP2-94-MB CRUISE TRACK
May 17 – June 17, 1994
San Diego, CA – Rodman, Panama

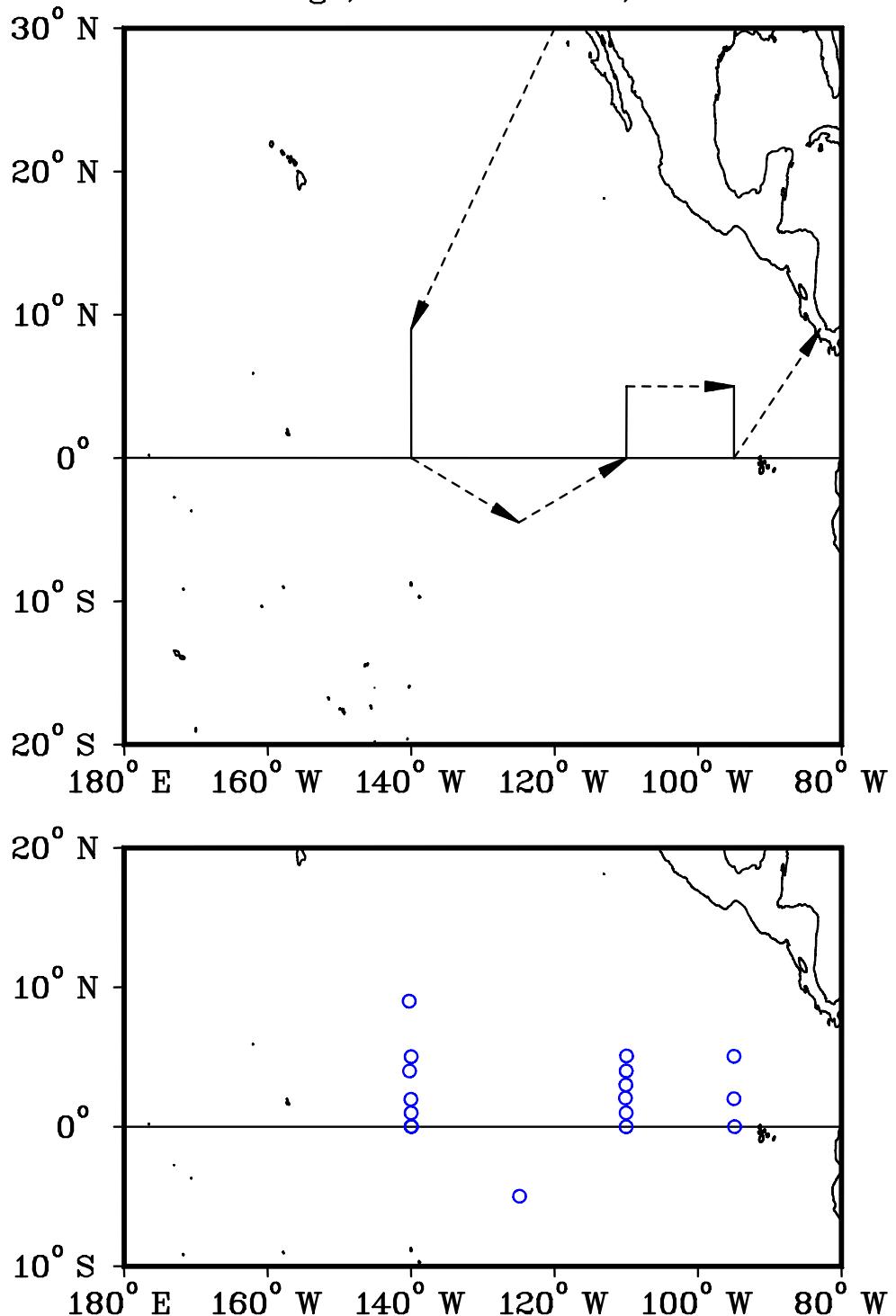


Fig. 1j. EP2-94-MB cruise track and station locations.

Table 1j. EP2-94-MB CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	9 0.4N	140 15.5W	23 MAY 94	722	90	5	4836	991
2	5 1.7N	139 59.4W	24 MAY 94	411	125	13	4453	992
3	4 0.0N	140 13.0W	25 MAY 94	959	128	12	4204	991
4	1 58.2N	140 1.5W	26 MAY 94	730	95	15	0	995
5	1 0.0N	139 59.6W	26 MAY 94	1309	124	14	4369	990
6	0 1.0N	139 57.1W	27 MAY 94	955	73	8	4290	3942
7	0 1.6N	139 59.6W	27 MAY 94	445	160	5	4215	492
8	4 58.5S	124 53.0W	2 JUN 94	602	112	14	4865	990
9	0 0.2N	110 1.4W	7 JUN 94	828	133	12	3742	989
10	1 0.1N	110 1.8W	7 JUN 94	1434	145	12	3697	990
11	2 3.7N	110 7.3W	7 JUN 94	2204	158	24	3763	990
12	3 0.2N	110 3.4W	8 JUN 94	336	170	18	3788	991
13	4 0.1N	110 0.8W	8 JUN 94	924	162	15	3840	990
14	5 4.8N	109 57.9W	9 JUN 94	456	169	16	4073	993
15	5 3.4N	94 59.4W	12 JUN 94	1137	190	18	3517	1301
16	2 0.8N	95 0.3W	13 JUN 94	711	160	13	3105	1904
17	0 0.5N	94 54.5W	14 JUN 94	620	133	12	3305	988

TG1-94-DI CRUISE TRACK
May 17 – June 19, 1994
Hilo, Hawaii – Honolulu, Hawaii

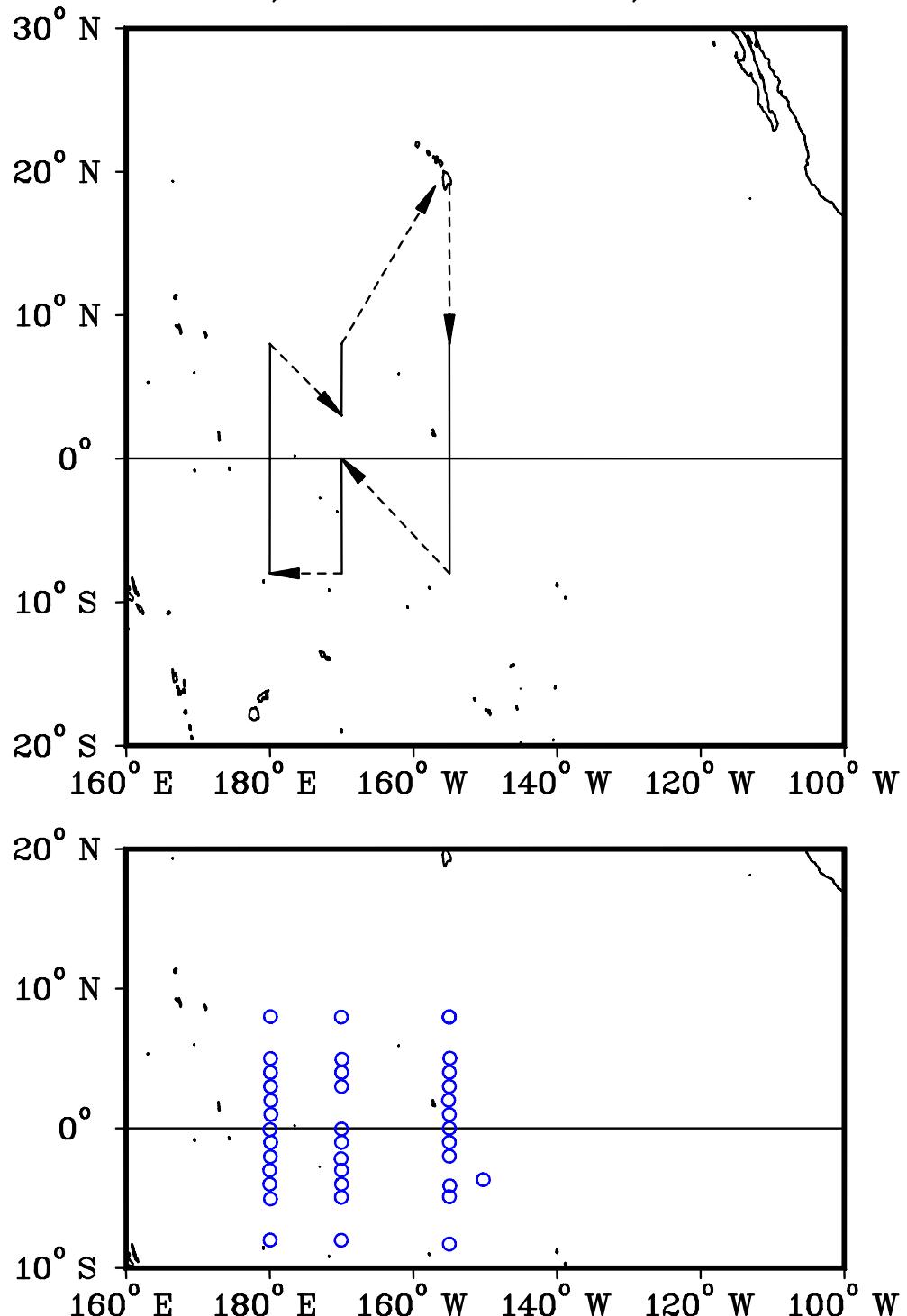


Fig. 1k. TG1-94-DI cruise track and station locations.

Table 1k. TG1-94-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	25 57.6N	137 28.7W	11 MAY 94	2222	60	17	4842	1500
2	7 59.9N	155 0.1W	19 MAY 94	1558	0	0	5148	1018
3	7 57.5N	155 1.2W	20 MAY 94	217	60	14	5176	1003
4	5 1.2N	154 55.7W	20 MAY 94	1643	45	7	4546	4617
5	4 0.7N	154 59.4W	21 MAY 94	412	320	3	986	1001
6	3 0.1N	154 59.8W	21 MAY 94	950	160	10	4722	1009
7	2 0.8N	155 6.2W	21 MAY 94	1507	150	6	4668	1003
8	0 59.6N	154 59.9W	22 MAY 94	1045	85	8	4748	1001
9	0 0.0S	155 0.0W	22 MAY 94	1555	95	8	4660	1000
10	1 0.1S	155 0.1W	23 MAY 94	127	60	8	1005	1009
11	1 59.5S	155 0.1W	23 MAY 94	948	70	10	4972	1002
12	3 40.3S	150 15.9W	24 MAY 94	1117	80	10	4591	1001
13	4 7.0S	154 56.0W	25 MAY 94	627	100	14	2337	1008
14	4 53.6S	154 59.2W	25 MAY 94	1141	100	17	5005	1005
15	8 17.0S	155 0.3W	27 MAY 94	212	45	8	990	1002
16	0 3.2S	170 0.7W	30 MAY 94	1516	110	5	5454	1005
17	1 0.2S	169 59.9W	30 MAY 94	2013	125	8	5403	1006
18	2 10.3S	170 3.6W	31 MAY 94	820	110	8	4975	1008
19	3 0.0S	170 0.2W	1 JUN 94	359	55	12	5077	1003
20	4 0.0S	170 0.0W	1 JUN 94	902	50	7	5728	1003
21	4 56.1S	170 1.3W	1 JUN 94	1511	40	11	5379	5462
22	8 0.6S	170 2.8W	2 JUN 94	950	40	7	5350	1003
23	7 59.8S	179 57.3W	4 JUN 94	202	35	13	5541	1002
24	5 3.2S	179 54.2W	4 JUN 94	1623	90	12	5694	5848
25	4 0.0S	179 59.9W	5 JUN 94	1340	150	4	5736	1004
26	3 0.0S	179 59.9E	5 JUN 94	1914	110	5	5079	1004
27	2 2.0S	179 54.9W	6 JUN 94	657	70	15	5223	1002
28	1 0.3S	179 51.9W	7 JUN 94	442	110	15	1002	1002
29	0 5.1S	179 58.0W	7 JUN 94	944	120	15	5241	1007
30	1 0.0N	179 50.0W	8 JUN 94	1035	140	11	5795	1004
31	1 59.3N	179 51.0W	8 JUN 94	1542	45	7	1003	1003
32	2 59.8N	179 53.8W	9 JUN 94	955	80	20	5603	1004
33	4 0.0N	179 54.0W	9 JUN 94	1456	90	15	5711	1002
34	4 59.8N	179 54.3W	10 JUN 94	900	60	22	5625	1008
35	8 0.0N	179 54.5W	11 JUN 94	25	90	11	5909	1013
37	2 59.8N	170 0.1W	14 JUN 94	354	140	7	991	1005
38	4 0.2N	169 59.5W	14 JUN 94	857	160	5	5626	1007
39	4 56.6N	169 57.1W	14 JUN 94	1514	300	5	5701	5853
40	7 58.2N	170 2.2W	15 JUN 94	2235	100	12	5537	1000

EP3-94-MB CRUISE TRACK
August 4 – 26, 1994
Rodman, Panama – San Diego, CA

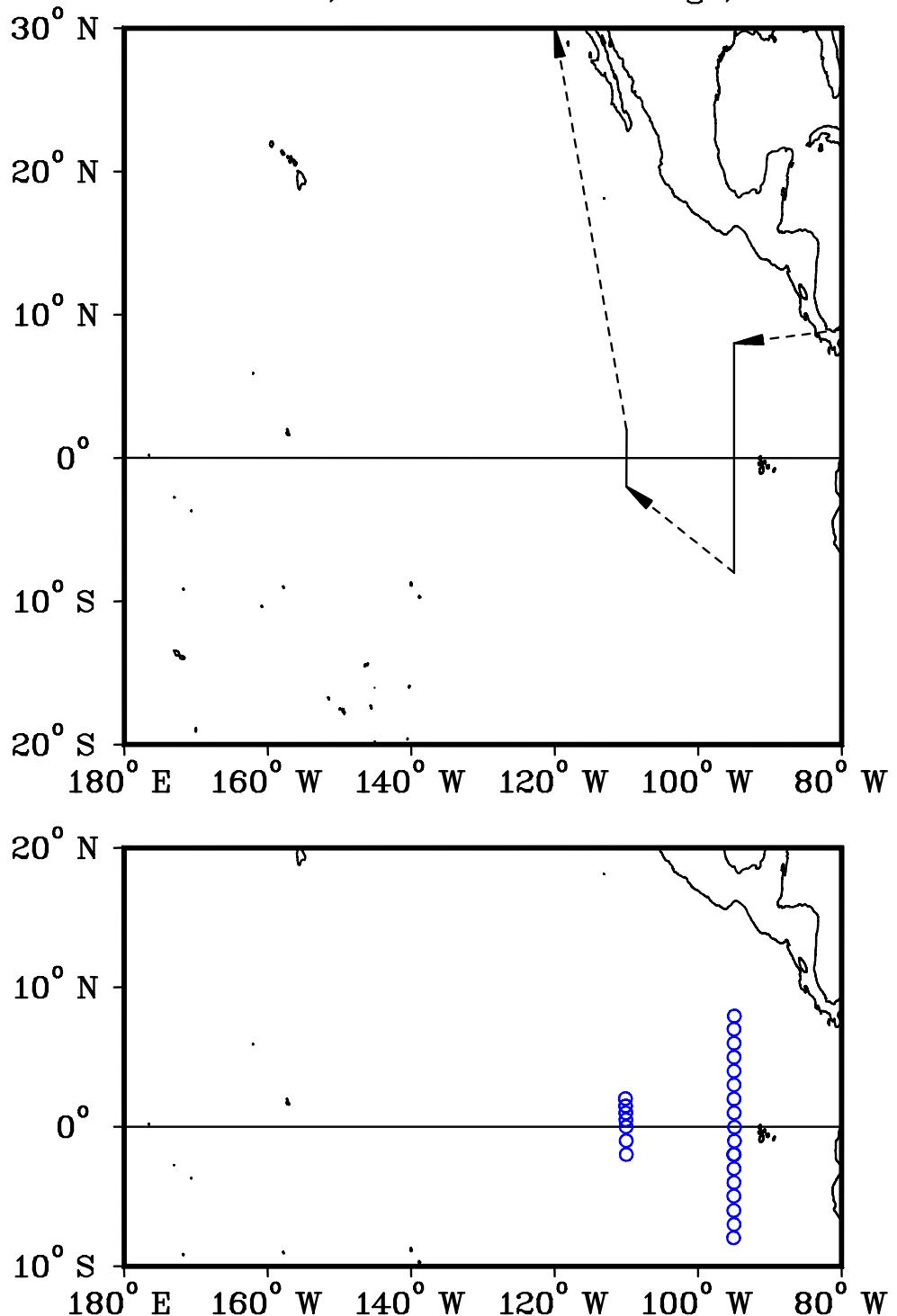


Fig. 11. EP3-94-MB cruise track and station locations.

Table 11. EP3-94-MB CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	7 56.5N	94 57.3W	8 AUG 94	535	248	13	3530	1000
2	6 59.9N	95 0.1W	8 AUG 94	1134	226	20	3540	999
3	5 59.6N	94 59.4W	8 AUG 94	1717	204	18	3595	1013
4	4 59.5N	94 59.5W	8 AUG 94	2253	206	21	3542	1000
5	3 59.8N	94 59.9W	9 AUG 94	415	185	19	3345	1004
6	3 0.4N	95 0.2W	9 AUG 94	945	177	14	3156	1000
7	1 59.8N	95 0.4W	10 AUG 94	347	165	15	2612	1004
8	1 0.0N	94 58.6W	10 AUG 94	949	158	15	2462	1003
9	0 1.7S	94 55.4W	10 AUG 94	1646	171	6	3310	2999
10	1 1.1S	94 56.8W	11 AUG 94	146	155	12	3404	2999
11	1 59.2S	95 0.8W	11 AUG 94	810	187	4	3328	201
12	1 59.2S	95 1.0W	11 AUG 94	935	187	4	3328	2999
13	1 58.4S	94 59.9W	12 AUG 94	105	162	12	3370	500
14	3 0.0S	95 0.0W	12 AUG 94	651	140	16	3574	1000
15	3 59.6S	95 0.5W	12 AUG 94	1228	142	23	3687	1000
16	4 57.8S	95 1.3W	12 AUG 94	1832	120	18	3645	1004
17	6 0.0S	95 1.3W	13 AUG 94	117	130	21	2027	1006
18	7 0.0S	95 0.1W	13 AUG 94	639	125	20	3366	1000
19	7 57.6S	95 3.3W	13 AUG 94	2022	134	21	3958	1003
20	1 59.2S	110 0.6W	17 AUG 94	607	105	16	3972	1003
21	0 59.9S	110 1.4W	17 AUG 94	1153	115	15	3999	999
22	0 0.1S	110 1.8W	17 AUG 94	1946	115	16	3696	2999
23	0 29.9N	110 3.4W	17 AUG 94	2333	120	20	3815	1003
24	0 59.9N	110 4.7W	18 AUG 94	245	121	21	3760	1006
25	1 29.6N	110 6.3W	18 AUG 94	600	120	20	3788	1004
26	2 1.2N	110 8.4W	18 AUG 94	958	135	19	3894	3000

EP4-94-MB CRUISE TRACK
August 30 – September 25, 1994
San Diego, CA – Rodman, Panama

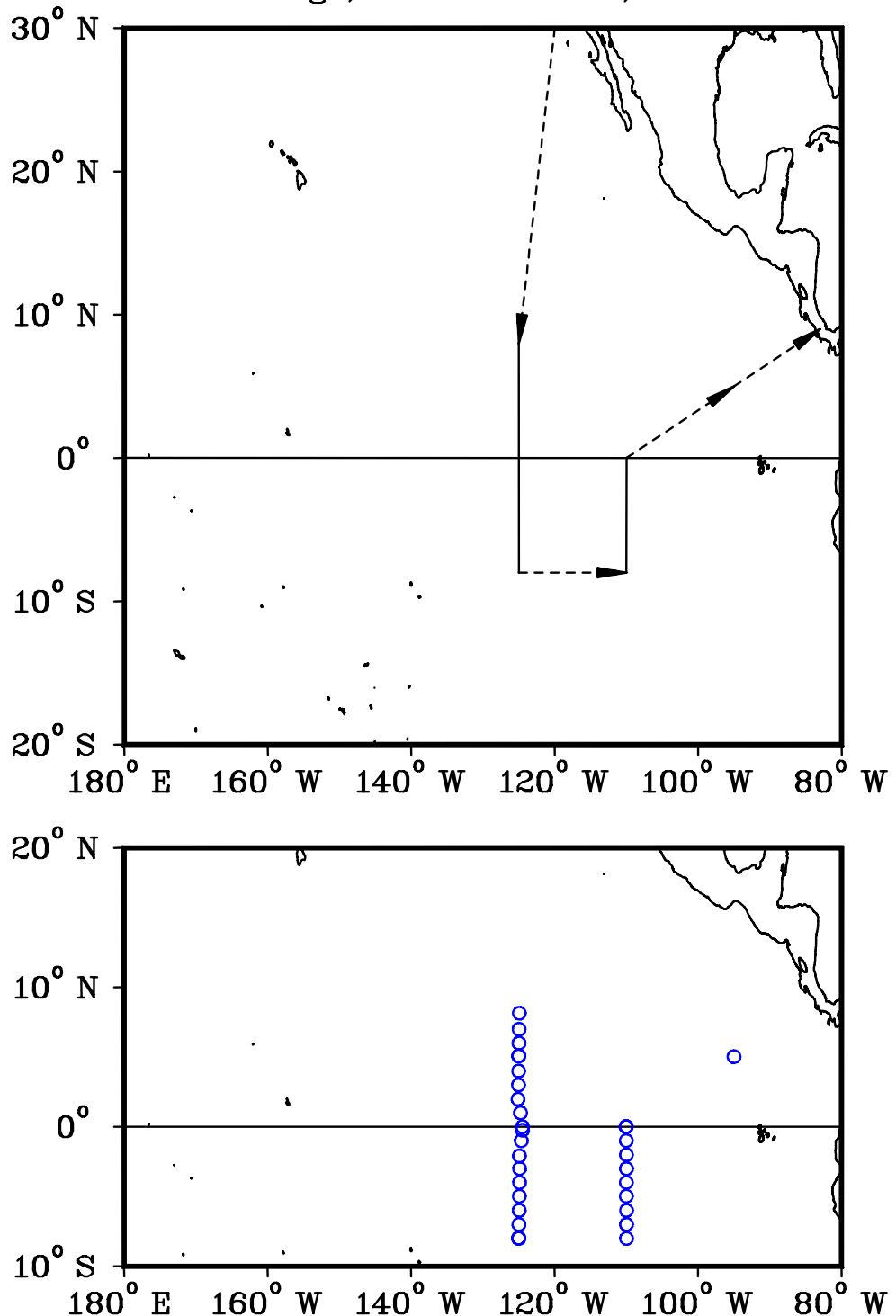


Fig. 1m. EP4-94-MB cruise track and station locations.

Table 1m. EP4-94-MB CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	8 8.8N	124 54.6W	4 SEP 94	1743	182	18	4445	1005
2	6 59.9N	124 56.6W	5 SEP 94	17	175	14	3847	1006
3	6 0.0N	124 57.1W	5 SEP 94	606	155	15	4426	1011
4	5 4.6N	125 1.0W	5 SEP 94	1134	159	18	4415	1000
5	5 5.3N	124 58.0W	6 SEP 94	245	165	16	4386	1012
6	3 59.9N	125 0.6W	6 SEP 94	941	160	26	4415	1001
7	3 0.2N	125 2.3W	6 SEP 94	1542	157	24	4455	998
8	1 58.8N	125 5.7W	6 SEP 94	2235	145	18	4699	969
9	1 0.1N	124 44.2W	7 SEP 94	530	120	20	4588	1008
10	0 0.2N	124 28.1W	7 SEP 94	1215	130	20	4468	1500
11	0 14.8S	124 28.2W	8 SEP 94	800	120	22	2421	500
12	1 0.1S	124 37.9W	8 SEP 94	1310	155	13	4651	998
13	2 5.3S	124 54.0W	9 SEP 94	741	125	12	4778	1000
14	3 0.0S	124 52.6W	9 SEP 94	1336	88	20	4639	1000
15	4 0.0S	124 52.9W	9 SEP 94	1929	115	20	4556	1001
16	4 58.8S	124 54.6W	10 SEP 94	202	87	20	4542	1005
17	5 59.6S	124 55.7W	10 SEP 94	811	110	18	4556	1000
18	7 0.2S	124 58.5W	10 SEP 94	1418	70	26	4665	1001
19	7 59.8S	124 59.1W	11 SEP 94	614	85	20	4521	3001
20	7 59.2S	125 0.8W	11 SEP 94	2027	80	18	4520	499
21	7 58.4S	125 1.3W	12 SEP 94	2045	84	17	4474	499
22	8 0.3S	109 58.2W	16 SEP 94	309	110	20	3400	1011
23	7 0.0S	109 58.9W	16 SEP 94	910	114	14	3468	1000
24	6 0.0S	109 58.7W	16 SEP 94	1451	126	21	3337	998
25	4 58.5S	109 59.9W	16 SEP 94	2112	162	14	3583	998
26	3 59.7S	109 59.9W	17 SEP 94	240	145	14	3693	1006
27	3 0.1S	109 58.8W	17 SEP 94	816	98	15	3864	1006
28	2 0.4S	109 59.5W	17 SEP 94	1400	117	16	3864	1001
29	0 59.6S	110 0.3W	17 SEP 94	1958	116	11	3980	1001
30	0 0.8N	109 59.7W	18 SEP 94	603	170	4	3817	3005
31	0 0.1N	110 2.3W	19 SEP 94	120	160	11	3742	1009
32	5 1.8N	94 58.9W	22 SEP 94	804	210	17	3574	3005

TG2-94-DI CRUISE TRACK
October 4 – 27, 1994
Hilo, Hawaii – Kahului, Hawaii

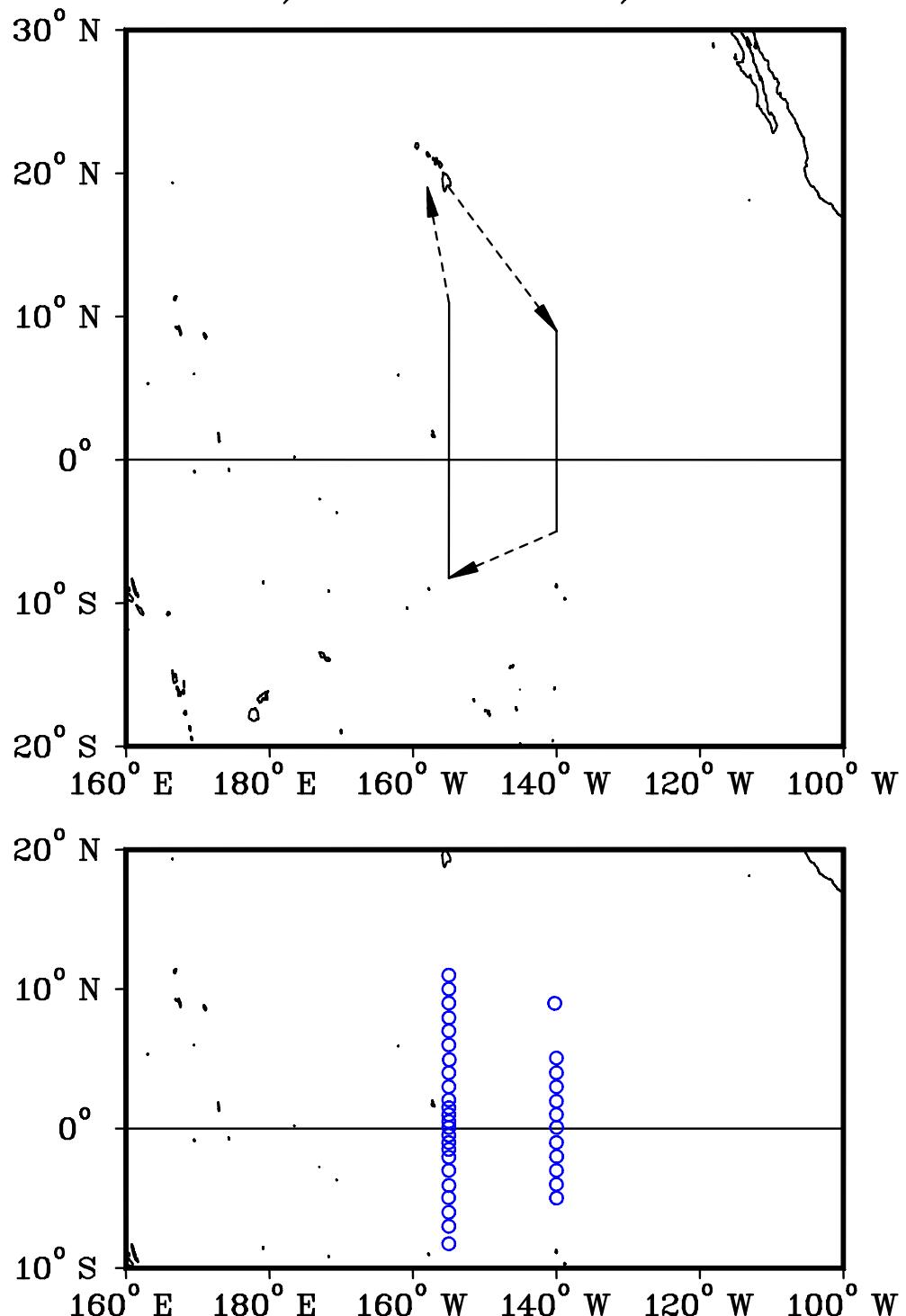


Fig. 1n. TG2-94-DI cruise track and station locations.

Table 1n. TG2-94-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	8 59.0N	140 14.1W	8 OCT 94	2020	340	4	4852	1003
2	5 3.6N	139 59.9W	9 OCT 94	1256	220	12	4213	4274
3	4 0.1N	140 0.0W	10 OCT 94	833	155	18	4349	1010
4	2 59.8N	140 0.1W	10 OCT 94	1346	155	17	4301	1003
5	1 57.6N	140 0.2W	10 OCT 94	1959	145	18	4373	1004
6	1 0.2N	140 0.2W	11 OCT 94	45	0	0	0	1002
7	0 5.2N	139 57.9W	11 OCT 94	606	105	13	4316	4005
8	0 59.9S	140 0.0W	12 OCT 94	1251	100	15	4275	1002
9	1 59.8S	139 58.0W	13 OCT 94	555	95	14	4318	1002
10	2 59.9S	140 0.1W	13 OCT 94	1056	90	13	4495	1005
11	4 0.0S	140 0.0W	13 OCT 94	1542	90	13	4475	1004
12	4 58.5S	139 59.0W	14 OCT 94	302	120	16	3984	4011
13	8 15.4S	155 0.1W	17 OCT 94	724	70	17	5298	1001
14	7 0.2S	155 0.2W	17 OCT 94	1321	60	11	5113	1001
15	6 0.0S	155 0.0W	17 OCT 94	1824	70	11	5217	1002
16	4 57.3S	155 2.2W	18 OCT 94	836	100	9	4625	4454
17	4 4.5S	154 59.0W	19 OCT 94	327	95	15	2686	1002
18	3 0.0S	155 0.0W	19 OCT 94	837	115	17	4930	1003
19	2 2.8S	155 0.6W	19 OCT 94	1413	120	9	4598	4654
20	1 29.6S	155 0.0W	20 OCT 94	701	75	15	4803	1005
21	0 59.8S	155 0.0W	20 OCT 94	1002	65	12	4745	1001
22	0 28.9S	155 0.0W	20 OCT 94	1300	70	9	4875	1001
23	0 4.6N	155 0.6W	21 OCT 94	604	50	4	4632	4428
24	0 30.3N	155 0.0W	21 OCT 94	936	130	14	4765	1005
25	1 0.0N	155 0.5W	21 OCT 94	1233	75	15	4745	1000
26	1 30.0N	155 0.1W	21 OCT 94	1520	100	9	995	1004
27	2 3.3N	155 0.3W	21 OCT 94	1949	90	12	4713	4505
28	3 0.0N	155 0.0W	22 OCT 94	124	100	8	4724	1002
29	3 59.9N	155 0.0W	22 OCT 94	625	100	4	4668	1003
30	4 56.2N	154 56.0W	22 OCT 94	1302	120	6	4592	4394
31	6 0.0N	155 0.0W	23 OCT 94	816	105	10	4862	1002
32	7 0.2N	154 59.8W	23 OCT 94	1255	130	7	4978	1003
33	7 56.5N	154 59.2W	23 OCT 94	1716	160	8	1134	1002
34	9 0.0N	155 0.0W	23 OCT 94	2345	100	8	5274	1003
35	10 0.2N	155 0.0W	24 OCT 94	432	100	11	5362	1002
36	10 59.9N	155 0.0W	24 OCT 94	922	75	15	5288	1001

TG3-94-DI CRUISE TRACK
November 1 – 25, 1994
Kahului, Hawaii – Honolulu, Hawaii

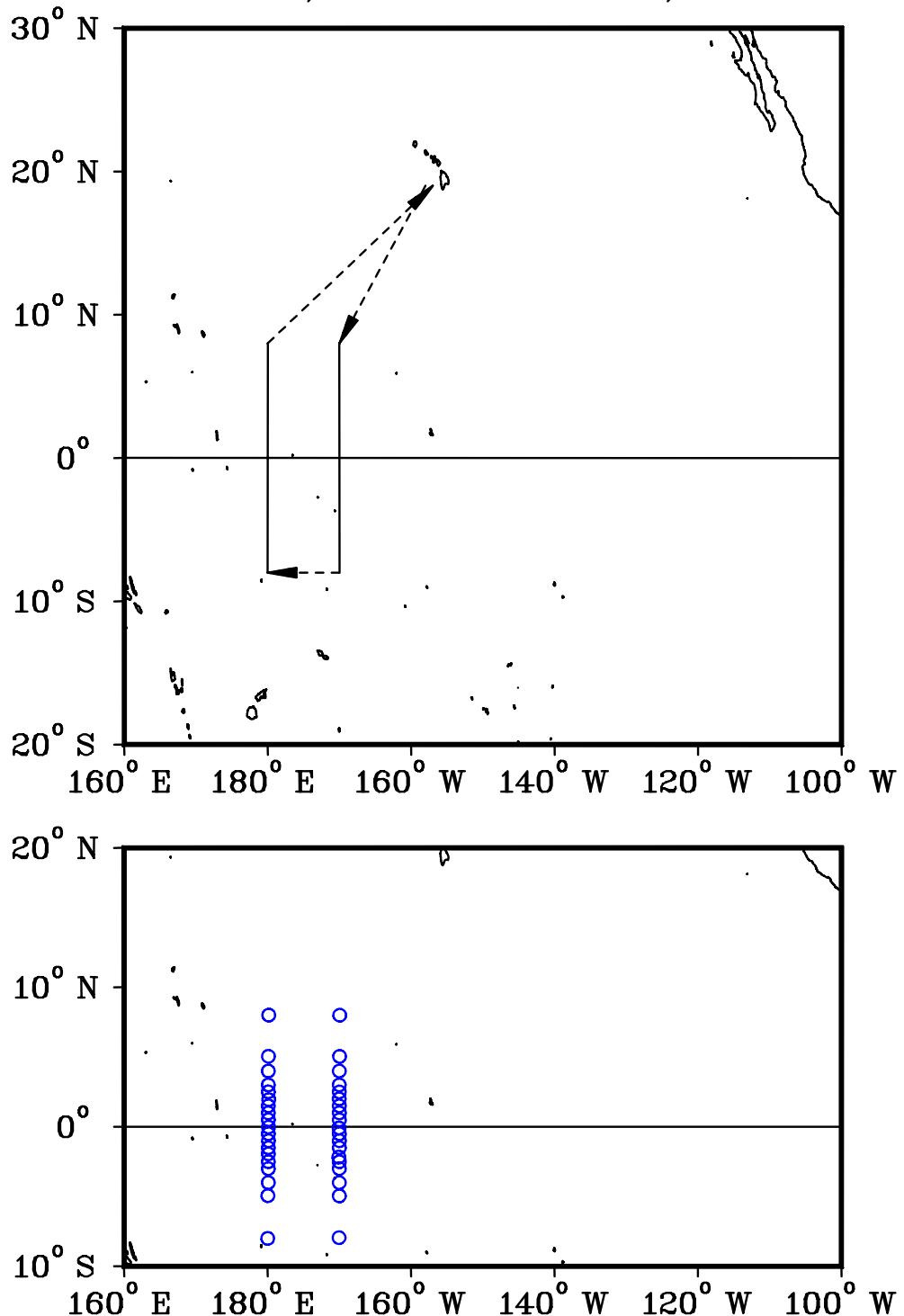


Fig. 1o. TG3-94-DI cruise track and station locations.

Table 1o. TG3-94-DI CTD cast summary.

CAST #	LATITUDE	LONGITUDE	DATE	TIME	W/D T	W/S (kts)	DEPTH (m)	CAST (db)
1	8 0.0N	169 56.6W	4 NOV 94	1244	270	9	5368	3003
2	5 2.8N	169 57.9W	5 NOV 94	1359	285	7	5673	1001
3	3 59.9N	170 0.0W	5 NOV 94	1942	295	7	5642	1003
4	3 0.1N	170 0.1W	6 NOV 94	47	325	4	5443	1001
5	2 29.8N	170 0.1W	6 NOV 94	343	350	5	5325	1003
6	2 0.0N	170 1.0W	6 NOV 94	702	55	9	5373	1002
7	1 30.1N	170 0.0W	6 NOV 94	1007	130	5	5497	1003
8	1 0.2N	169 59.9W	6 NOV 94	1309	120	6	5417	1004
9	0 29.8N	169 59.8W	6 NOV 94	1613	90	10	5409	1003
10	0 5.1S	170 2.2W	6 NOV 94	2021	120	12	5503	3003
11	0 29.9S	169 59.7W	6 NOV 94	2335	120	7	5705	1001
12	0 59.7S	169 59.9W	7 NOV 94	347	125	6	5346	5052
13	1 30.2S	169 59.6W	7 NOV 94	843	105	3	5233	3005
14	2 10.1S	170 4.0W	8 NOV 94	648	70	5	5045	4853
15	2 30.1S	170 0.0W	9 NOV 94	52	0	0	5546	1004
16	3 0.0S	170 0.0W	9 NOV 94	349	0	0	5088	1000
17	4 0.2S	170 0.0W	9 NOV 94	833	0	0	5705	1002
18	4 57.1S	169 59.9W	9 NOV 94	1342	145	8	5351	3003
19	7 56.8S	170 1.8W	10 NOV 94	1317	0	0	5334	5101
20	8 0.0S	179 59.0W	13 NOV 94	736	60	8	5530	5303
21	4 56.3S	179 57.4W	15 NOV 94	702	85	5	5630	5452
22	4 0.0S	179 54.0W	15 NOV 94	1245	35	5	6018	1004
23	3 0.0S	179 54.0W	15 NOV 94	1725	305	15	5416	1003
24	2 29.8S	179 53.8W	15 NOV 94	2023	105	17	5409	1000
25	1 56.2S	179 53.7W	16 NOV 94	135	300	4	5390	5102
26	1 30.1S	179 53.8W	16 NOV 94	517	0	0	5199	1000
27	0 59.8S	179 53.4W	16 NOV 94	815	260	4	5326	1001
28	0 29.8S	179 53.7W	16 NOV 94	1116	300	6	4564	1002
29	0 1.2S	179 52.5W	16 NOV 94	1517	260	4	5298	5103
30	0 30.3N	179 53.7W	17 NOV 94	709	220	7	5681	1001
31	1 0.1N	179 54.0W	17 NOV 94	1013	0	0	5739	1005
32	1 30.2N	179 53.8W	17 NOV 94	1308	0	0	5565	1003
33	1 56.9N	179 50.3W	17 NOV 94	1630	0	0	5592	3004
34	2 30.3N	179 53.7W	17 NOV 94	2056	0	0	5242	1002
35	3 0.2N	179 53.9W	17 NOV 94	2355	0	0	5607	1048
36	3 59.8N	179 53.8W	18 NOV 94	429	275	5	5703	1000
37	5 3.2N	179 52.7W	18 NOV 94	943	0	0	5674	1001
38	8 0.5N	179 50.2W	19 NOV 94	512	0	0	5865	5707

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Table 2. Weather condition code used to describe each set of CTD measurements.

Code	Weather Condition
0	Clear (no cloud)
1	Partly cloudy
2	Continuous layer(s) of cloud(s)
3	Sandstorm, dust storm, or blowing snow
4	Fog, thick dust or haze
5	Drizzle
6	Rain
7	Snow, or rain and snow mixed
8	Shower(s)
9	Thunderstorms

Table 3. Sea state code used to describe each set of CTD measurements.

Code	Height (meters)	Description
0	0	Calm-glassy
1	0–0.1	Calm-rippled
2	0.1–0.5	Smooth-wavelet
3	0.5–1.25	Slight
4	1.25–2.5	Moderate
5	2.5–4	Rough
6	4–6	Very rough
7	6–9	High
8	9–14	Very high
9	>14	Phenomenal

Table 4. Visibility code used to describe each set of CTD measurements.

Code	Visibility
0	<50 meters
1	50–200 meters
2	200–500 meters
3	500–1,000 meters
4	1–2 km
5	2–4 km
6	4–10 km
7	10–20 km
8	20–50 km
9	50 km or more

Table 5. Cloud type.

Code	Cloud Types
0	Cirrus
1	Cirrocumulus
2	Cirrostratus
3	Altocumulus
4	Altostratus
5	Nimbostratus
6	Stratocumulus
7	Stratus
8	Cumulus
9	Cumulonimbus
X	Clouds not visible

Table 6. Cloud amount.

Code	Cloud Amount
0	0
1	1/10 or less but not zero
2	2/10–3/10
3	4/10
4	5/10
5	6/10
6	7/10–8/10
7	9/10
8	10/10
9	Sky obscured or not determined

All CTD and Hydrographic Data can be obtained by contacting K.E. McTaggart at kem@pmel.noaa.gov.